



Road & Bridge Design Publications

Monthly Update – September 2023

Revisions for the month of **September** are listed and displayed below and will be included in projects submitted for the **January** letting.

E-mail road related questions to MDOT-Road-Design-Standards@michigan.gov.

E-mail bridge related questions to MDOT-Bridge-Design-Standards@michigan.gov.

Special Details

R-44-G: Concrete Pavement Repair: Added “milling” as an alternate method for providing vertical edges for Detail 7 and Detail 8 joint repairs. Also added “other approved material” as an alternate for the removed material in Cases IV and V for Detail 7 and Detail 8 joint repairs.

R-66-E: Guardrail Departing Terminal Types B, T, & MGS: Revised the title of the detail for the terminal end shoe to include “Type A” guardrail.

B-102-D: Added a detail for placing slope paving at skewed structures. Updated the pour sequence and added alternate pour sequences.

Road Design Manual

6.03.09A1b: Superpave Mixture Number Designation & Thickness Guidelines: Revised the application rate for an Asphalt Stabilized Crack Relief Layer (ASCRL) from 85 to 100 lbs/syd per inch of compacted thickness.

Bridge Design Manual

7.01.15: Revised the shoulder width required for deck replacement projects on 2 lane freeway and interstate structures. Instead of requiring 14'-10" wide shoulders on every deck replacement project the revised policy requires the clear roadway of the bridge to be wide enough to meet the mobility and work zone safety needs of the corridor over the anticipated remaining life of the structure. This must include consideration of any bridge rehabilitation projects, pavement reconstruction projects, and pavement resurfacing projects. Documentation of how the work zone safety and mobility needs of the corridor have been considered will be required as part of the project scoping and scope verification phases of the project. Shoulder widths of 14'-10" will still be required for all projects that include superstructure replacements, complete replacements, and new bridge projects involving 2 lane freeway and interstate bridges.

7.03.01 B.4.: Clarified the use of spill through abutments. Use is allowed at stream crossings versus other abutment types.

Bridge Design Guides

6.20.03A: Updated weep hole spacing to be consistent with Guide 6.20.05.



Road & Bridge Design Publications

Monthly Update – September 2023

Updates to the MDOT Cell Library, Sample Plans, and other automated tools may be required in tandem with some of this month's updates. Until such updates can be made, it is the designer's/detailer's responsibility to manually incorporate any necessary revisions to notes and plan details to reflect these revisions.

Index to Special Details

9-25-2023

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SPECIAL DETAIL NUMBER	NUMBER OF SHEETS	TITLE	CURRENT DATE
21	2	GUARDRAIL AT INTERSECTIONS	6-6-22
24	8	GUARDRAIL ANCHORED IN BACKSLOPE TYPES 4B, 4T, & 4MGS-8	12-6-22
99	2	CHAIN LINK FENCE WITH WIRE ROPE	12-6-22
R-32-F	8	APPROACH CURB & GUTTER DOWNSPOUTS	9-20-22
R-32-SD	6	APPROACH CURB & GUTTER DOWNSPOUTS (FOR SAFETY SHAPES)	4-24-23
R-43-J	2	LOCATION OF TRANSVERSE JOINTS IN PLAIN CONCRETE PAVEMENT	1-4-22
*R-44-G	7	CONCRETE PAVEMENT REPAIR	9-18-23
R-45-K	2	PAVEMENT REINFORCEMENT FOR BRIDGE APPROACH	1-4-22
R-53-A	22	TEMPORARY CONCRETE BARRIER LIMITED DEFLECTION	8-14-15
R-56-F	6	GUARDRAIL MEDIAN OBJECT PROTECTION	4-11-23
R-60-J	16	GUARDRAIL TYPES A, B, BD, T, TD, MGS-8, & MGS-8D	8-15-23
R-62-H	4	GUARDRAIL APPROACH TERMINAL TYPE 2M	6-16-22
R-63-C	17	GUARDRAIL APPROACH TERMINAL TYPES 3B & 3T	3-7-23
*R-66-E	4	GUARDRAIL DEPARTING TERMINAL TYPES B, T, & MGS	9-14-23
R-67-G	16	GUARDRAIL ANCHORAGE, BRIDGE, DETAILS	12-6-22
R-67-SD	6	GUARDRAIL ANCHORAGE, BRIDGE, DETAILS (FOR SAFETY SHAPES)	4-4-23
R-72-D	6	GUARDRAIL LONG SPAN INSTALLATIONS	8-23-22
R-73-F	3	GUARDRAIL OVER BOX OR SLAB CULVERTS	8-1-19
R-80-F	8	GRANULAR BLANKETS, UNDERDRAINS, OUTLET ENDINGS, & BULKHEADS	6-28-21
R-88-E	4	STEEL END SECTION	3-7-23
R-100-I	4	SEEDING AND TREE PLANTING	8-3-21
R-110-B	3	PAVEMENT SAFETY EDGE	6-14-21
R-112-J	10	SHOULDER AND CENTER LINE CORRUGATIONS	8-2-23
R-126-I	5	PLACEMENT OF TEMPORARY CONCRETE & STEEL BARRIER	8-25-15
R-127-H	8	DELINEATOR INSTALLATIONS	8-11-23

* Denotes New or Revised Special Detail to be included in projects for (beginning with) the January letting.

Notes:

Former Standard Plans IV-87, IV-89, IV-90, and IV-91 Series, used for building cast-in-place concrete head walls for elliptical and circular pipe culverts, are now being replaced with plans that detail each specific size. The Bureau of Bridges & Structures, Structure Design Section, Special Structures Unit will provide special details for inclusion in construction plans for MDOT jobs. To assure prompt delivery, requests **must be made in advance**. Contact: MDOT-TriezenbergSquad@Michigan.gov

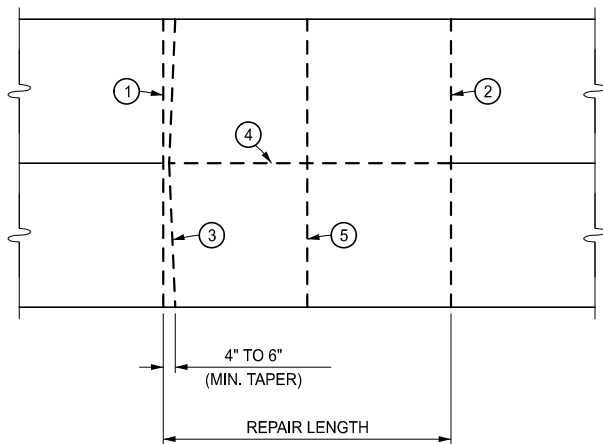
Former Standard Plans IV-93 and IV-94 series have been replaced with precast concrete box & three-sided culverts as per the 2020 Standard Specifications for Construction.

Index to Bridge Detail Sheets

9-25-2023

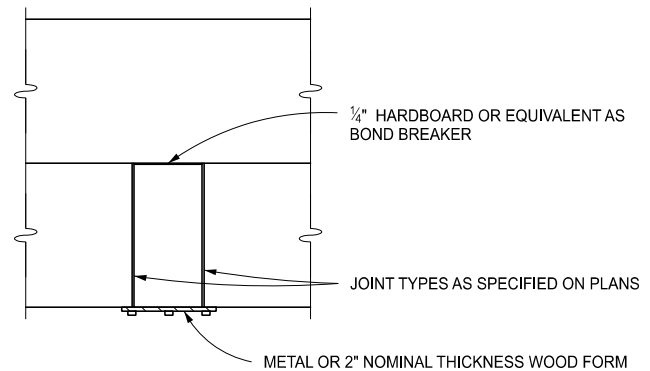
7

DETAIL NUMBER	NUMBER OF SHEETS	TITLE	CURRENT DATE
B-28-A	7	BRIDGE BARRIER RAILING, TYPE 7	9-2-20
B-29-A	8	BRIDGE BARRIER RAILING, TYPE 6	9-2-20
*B-102-D	4	STANDARD SLOPE PAVING DETAILS	9-18-23
EJ3AF	1 to 4	EXPANSION JOINT DETAILS (See Notes)	1-23-23
EJ4S	1 to 4	EXPANSION JOINT DETAILS (See Notes)	1-23-23
PC-1N	2	PRESTRESSED CONCRETE I-BEAM DETAILS (See Notes)	11-28-22
PC-2I	2	70" PRESTRESSED CONCRETE I-BEAM DETAILS (See Notes)	11-28-22
PC-4G	2	PRESTRESSED CONCRETE 1800 BEAM DETAILS (See Notes)	11-28-22
PC-5A	2	PRESTRESSED CONCRETE BULB-TEE BEAM DETAILS (See Notes)	11-28-22
<p>* Denotes New or Revised Special Detail to be included in projects for (beginning with) the January letting.</p> <p>Notes: Details EJ3AF & EJ4S are interactive, i.e., designers and detailers choose details based upon railing type and angle of crossing and fill in the project specific dimensions for the end plate. Place all details appropriate for the project (including the end plate), structure specific information, and the Expansion Joint Device quantity on the sheet. Add the sheet to the plans as a normal plan sheet. Call out and designate the location of the expansion joint device and the end plate on the Superstructure Sheet in the plan set.</p> <p>Details PC-1N, PC-2I, PC-4G, and PC-5A shall have structure specific information and quantities added to the sheet. The sheet shall then be added to the plans as a normal plan sheet.</p>			

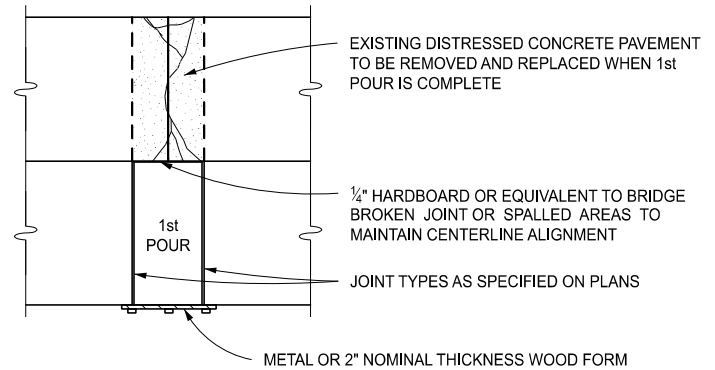


SAWING DIAGRAM FOR
FULL DEPTH CAST IN PLACE REPAIRS

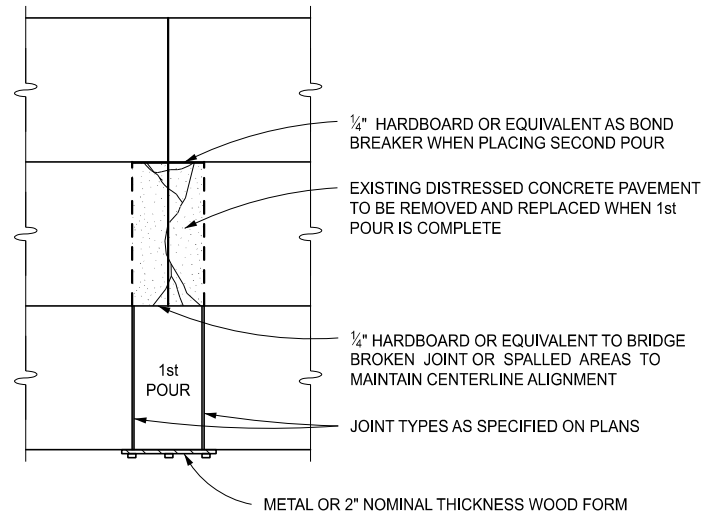
- ① & ② THESE SAW CUTS SHALL BE FULL DEPTH AND PERPENDICULAR TO THE EDGE OF THE ROADWAY, WITHIN A TOLERANCE OF 1". OVERCUTTING IS ALLOWED INTO ADJACENT SHOULDERS AND WITHIN THE LIMITS OF A SUBSEQUENT REPAIR TO THE ADJACENT LANE. OUTSIDE THESE LIMITS, OVERCUTTING IS NOT ALLOWED INTO ADJACENT NON-REINFORCED CONCRETE PAVEMENTS AND IS RESTRICTED TO 3" INTO ADJACENT REINFORCED CONCRETE PAVEMENTS.
- ③ THIS FULL DEPTH SAW CUT IS MADE TO FACILITATE OPENING A TRENCH ACROSS THE SLAB TO RELIEVE COMPRESSION IN THE PAVEMENT PRIOR TO REMOVAL OF THE FAILED AREA. THIS SAW CUT MAY BE OMITTED PROVIDED NO SPALLING OF THE REMAINING CONCRETE OCCURS. IF SPALLING DOES OCCUR, THE CONTRACTOR WILL BE REQUIRED TO MAKE THIS SAW CUT ON SUBSEQUENT REPAIRS. WHEN THIS SAW CUT IS USED AND THE ADJACENT LANE IS NOT REPAIRED, NO OVERCUTTING INTO THAT LANE SHALL BE MADE.
- ④ THIS LONGITUDINAL FULL DEPTH SAW CUT IS MADE BETWEEN LANES OR BETWEEN ANY COMBINATION OF THE FOLLOWING: LANE, RAMP, CURB, CONCRETE SHOULDER, OR PARTIAL LANE WIDTH REPAIR.
- ⑤ IF REQUIRED, INTERMEDIATE SAW CUTS MAY BE MADE TO REMOVE A SECTION OF PAVEMENT LANE WHICH IS OVER 5'-0" IN LENGTH, TO PERMIT LOADING INTO THE HAULING UNITS.
- ADDITIONAL SAW CUTS, AT CONTRACTOR'S EXPENSE, MAY BE MADE INSIDE THE REPAIR LIMITS TO REDUCE 5'-0" BY 12'-0" OR LESS SLABS INTO SMALLER PIECES TO FACILITATE REMOVAL.



ONE LANE REPAIRS
(2 - LANE ROADWAY SHOWN)



ALL LANES REPAIRED
(2 - LANE ROADWAY SHOWN)



MORE THAN ONE LANE REPAIRED
BUT REPAIR LESS THAN FULL WIDTH
(3 - LANE ROADWAY SHOWN)

FORMING NOTES:

STAKES USED TO HOLD HMA FILLER OR HARDBOARD IN PLACE DURING CONCRETE PLACEMENT SHALL BE REMOVED BEFORE SCREEDING THE CONCRETE.

ADJACENT LANE REPAIRS MAY BE CAST INTEGRALLY, WHEN APPROVED BY THE ENGINEER.

FORMING REQUIREMENTS FOR
CAST-IN-PLACE REPAIRS 12'-0" OR LESS

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT



DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

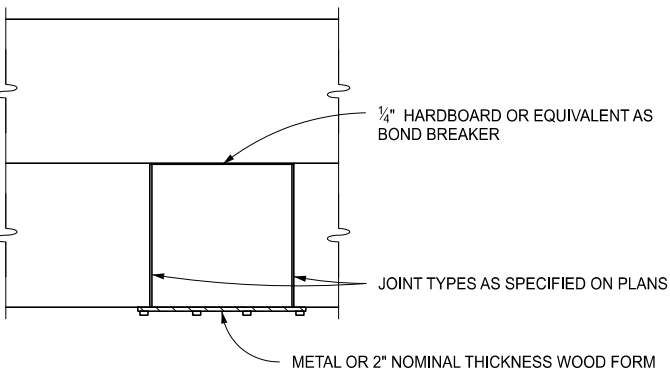
STANDARD PLAN FOR
CONCRETE PAVEMENT REPAIR

(SPECIAL DETAIL)
FHWA APPROVAL

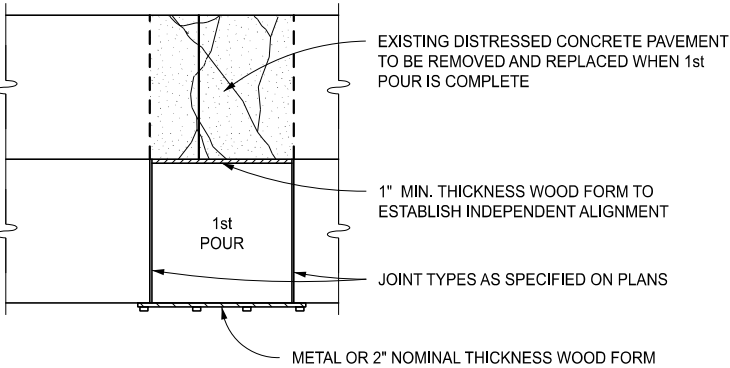
09/18/2023
PLAN DATE

R-44-G

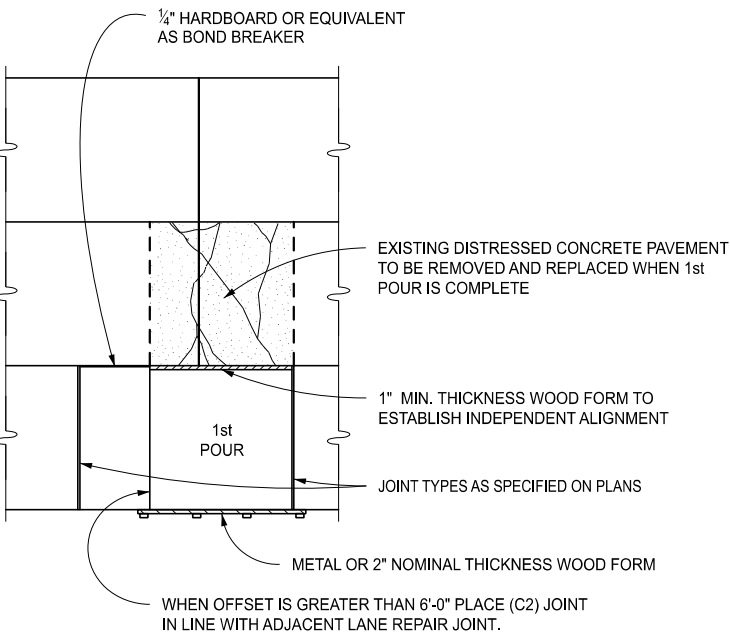
SHEET
1 OF 7



ONE LANE REPAIRS
(2 - LANE ROADWAY SHOWN)



ALL LANES REPAIRED
(2 - LANE ROADWAY SHOWN)



MORE THAN ONE LANE REPAIRED
BUT REPAIRS ARE OFFSET
(3 - LANE ROADWAY SHOWN)

FORMING NOTES:

WHERE REPAIRS LONGER THAN 12'-0" ARE REQUIRED, A NEW GRADE MUST BE ESTABLISHED ALONG THE OLD PAVEMENT INNER JOINT LINE INDEPENDENT OF THE OLD PAVEMENT SURFACE, SO THAT SCREEDING MAY BE DONE PERPENDICULAR TO THE CENTERLINE AND INDEPENDENT OF THE OLD PAVEMENT GRADE.

STAKES USED TO HOLD HMA FILLER OR HARDBOARD IN PLACE DURING CONCRETE PLACEMENT SHALL BE REMOVED BEFORE SCREEDING THE CONCRETE.

ADJACENT LANE REPAIRS MAY BE CAST INTEGRALLY, WHEN APPROVED BY THE ENGINEER.

FORMING REQUIREMENTS FOR
CAST-IN-PLACE REPAIRS GREATER THAN 12'-0"



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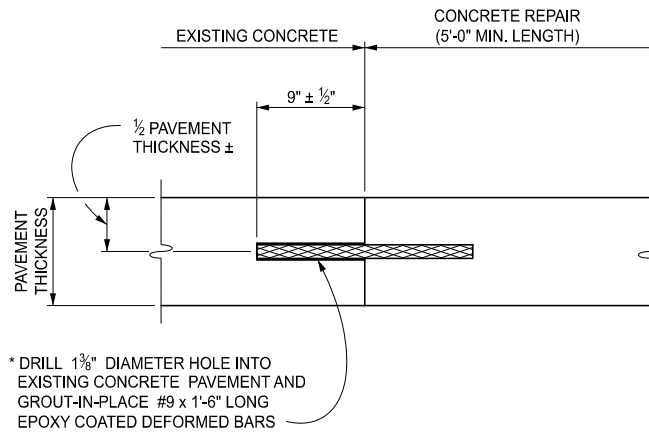
STANDARD PLAN FOR
CONCRETE PAVEMENT REPAIR

(SPECIAL DETAIL)
FHWA APPROVAL

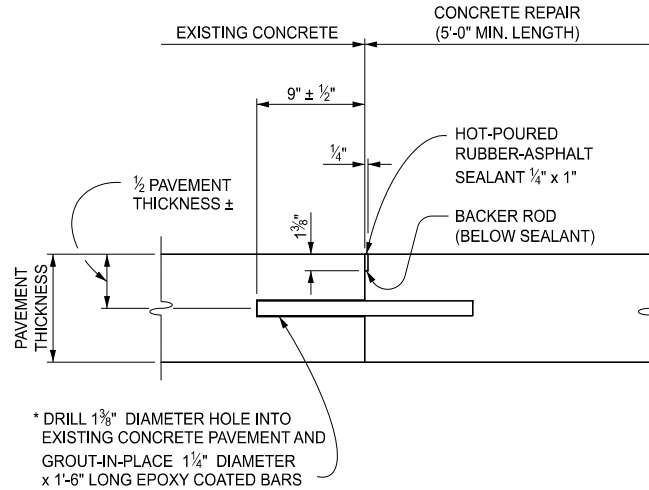
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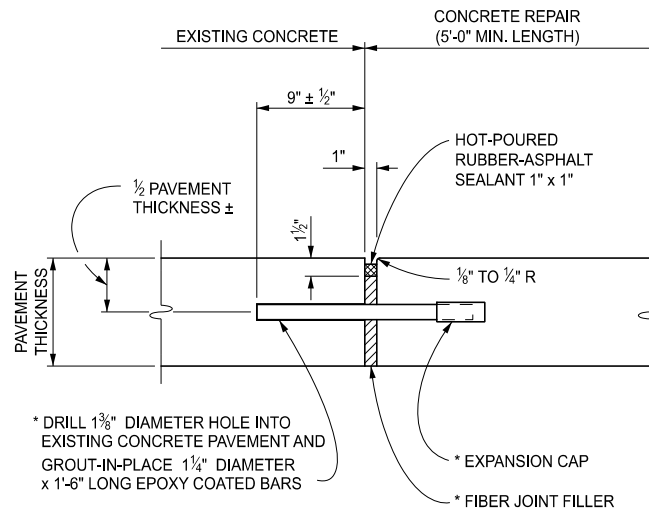
SHEET
2 OF 7



TIED JOINT, Trg



CONTRACTION JOINT, Crg



EXPANSION JOINT, Erg

* SEE SHEET 3 OF 6 FOR BAR SPACING
AND SHEET 6 OF 6 FOR NOTES.

CAST-IN-PLACE REPAIR JOINTS USING GROUTED DOWEL OR DEFORMED BARS



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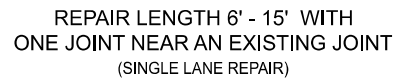
STANDARD PLAN FOR CONCRETE PAVEMENT REPAIR

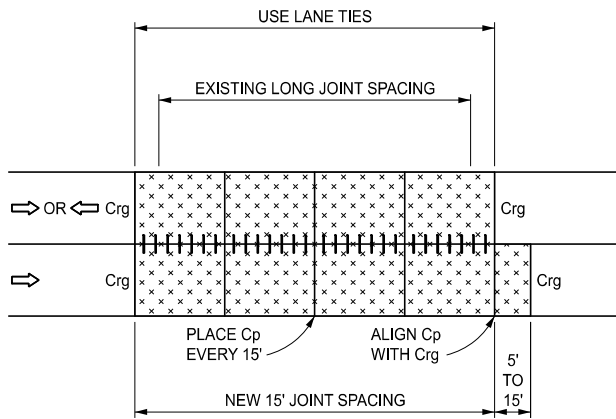
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FHWA APPROVAL

09/18/2023
PLAN DATE

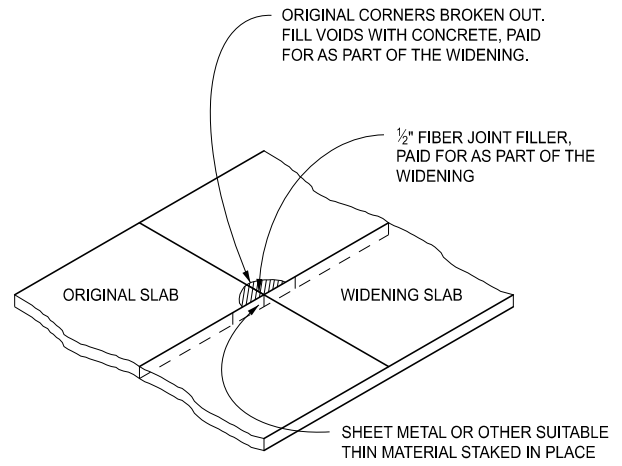
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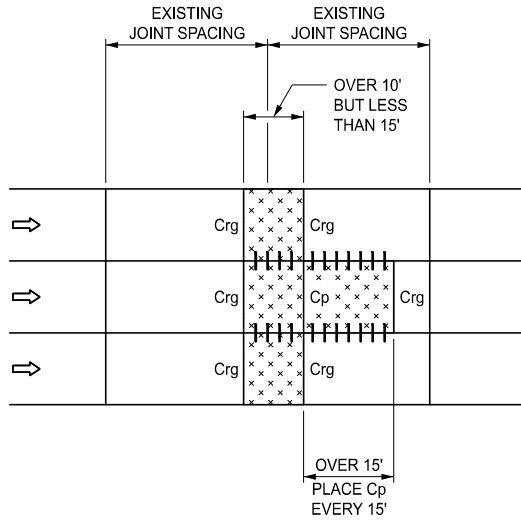




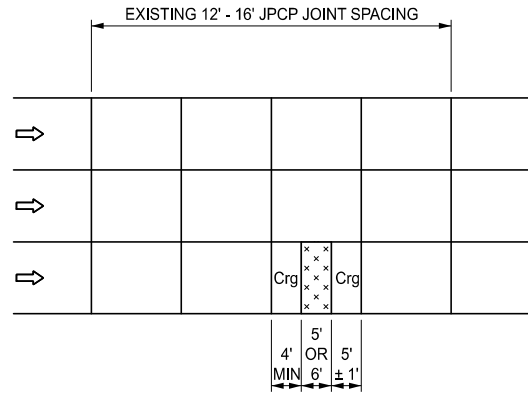
LONG REPAIR SHOWING
Cp JOINT ALIGNMENTS AND LANE TIES



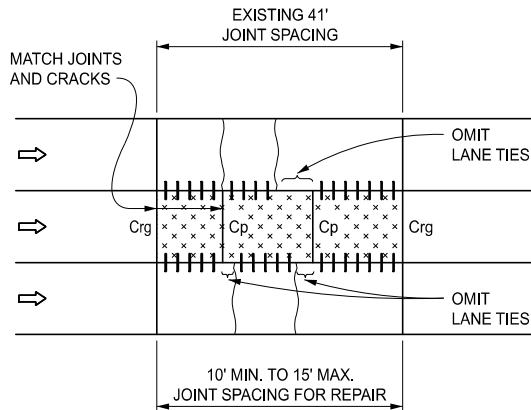
JOINT PATCH ADJACENT TO WIDENING SLAB



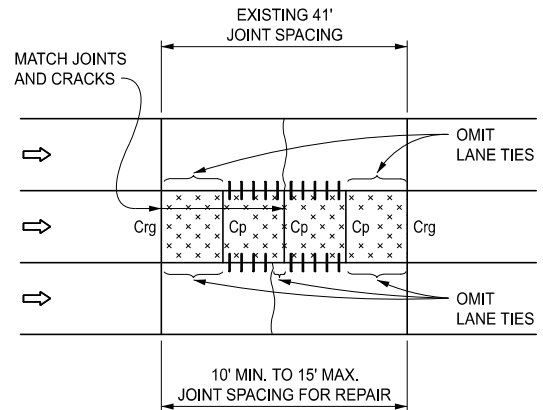
FULL WIDTH MULTI-LANE REPAIRS
WITH OFFSET IN ONE LANE



REPAIR OF 12' - 16' JPCP WITH
ONLY ONE MID-PANEL CRACK
(IF THE PANEL HAS MORE THAN ONE MID-PANEL CRACK
OR IF THE JOINT SPACING IS 12' REPLACE ENTIRE PANEL)
(SINGLE LANE OR FULL WIDTH REPAIR)



TWO CRACK PANEL REPAIR



MID PANEL CRACK REPAIR



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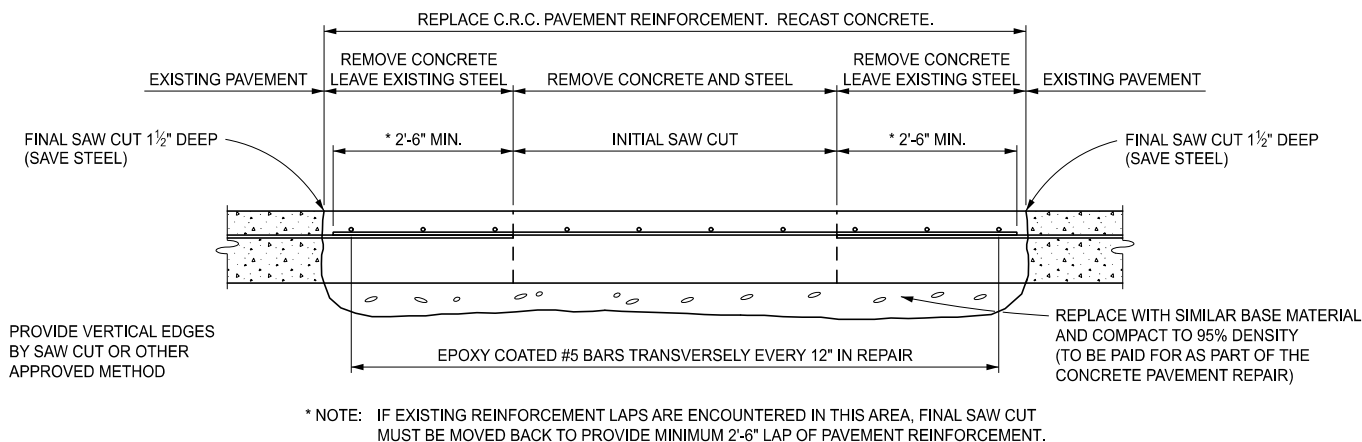
STANDARD PLAN FOR
CONCRETE PAVEMENT REPAIR

(SPECIAL DETAIL)
FHWA APPROVAL

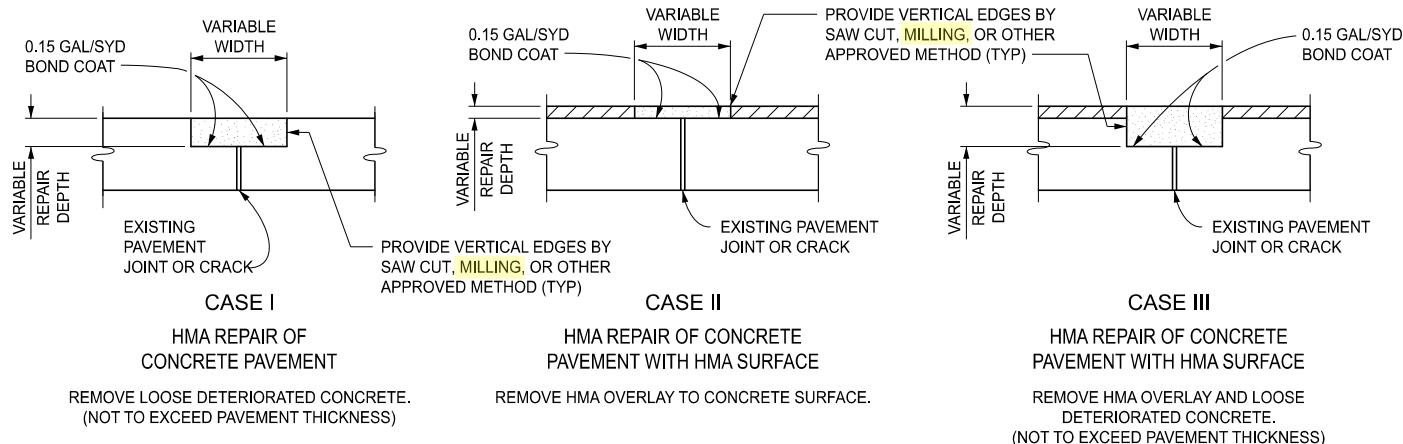
09/18/2023
PLAN DATE

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5 OF 7



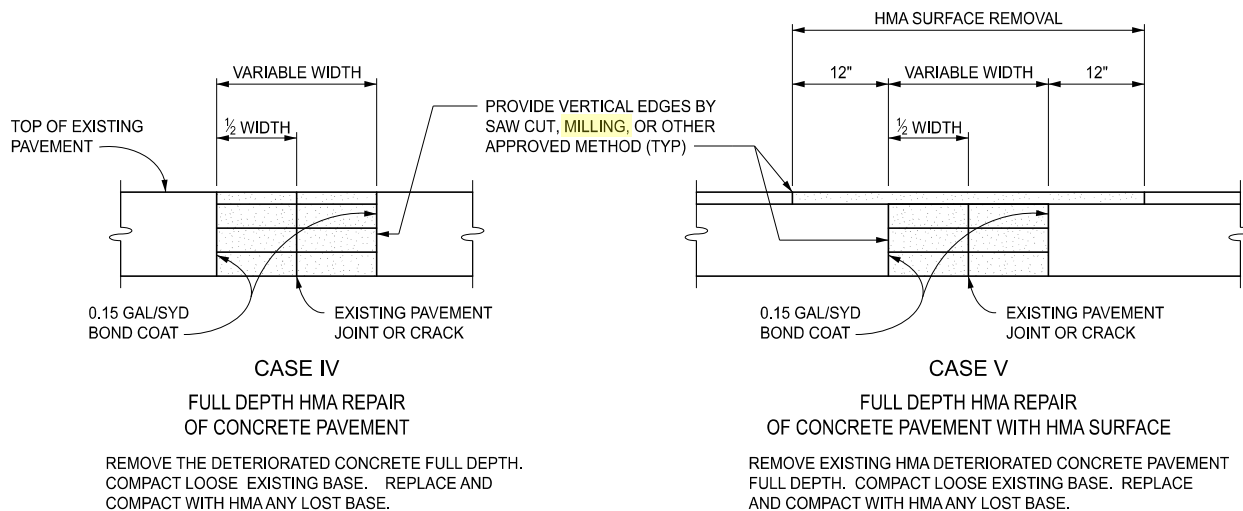
REPAIRING CONTINUOUSLY REINFORCED CONCRETE



FOR CASES I, II, & III, THE REMOVED MATERIAL SHALL BE REPLACED WITH A HMA TOP COURSE MIXTURE, OR OTHER APPROVED MIXTURE. THE HMA SHALL BE COMPACTED WITH A MACHINE VIBRATOR OR APPROVED ROLLER WITH BASE LIFT THICKNESSES NOT TO EXCEED 3" AND WITH THE TOP LIFT THICKNESS NOT TO EXCEED 2". THE FINAL SURFACE OF THE REPAIR SHALL BE FLUSH WITH THE EXISTING PAVEMENT SURFACE.

SURFACE REPAIR FOR JOINT OR CRACK (TRANSVERSE OR LONGITUDINAL)

DETAIL
7



FOR CASES IV, & V, THE REMOVED MATERIAL SHALL BE REPLACED WITH A HMA TOP COURSE MIXTURE, OR OTHER APPROVED MIXTURE. THE HMA SHALL BE COMPACTED WITH A MACHINE VIBRATOR OR APPROVED ROLLER WITH BASE LIFT THICKNESSES NOT TO EXCEED 3" AND WITH THE TOP LIFT THICKNESS NOT TO EXCEED 2". THE FINAL SURFACE OF THE REPAIR SHALL BE FLUSH WITH THE EXISTING PAVEMENT SURFACE.

FULL DEPTH REPAIR FOR JOINT OR CRACK (TRANSVERSE OR LONGITUDINAL)

DETAIL
8



DEPARTMENT DIRECTOR
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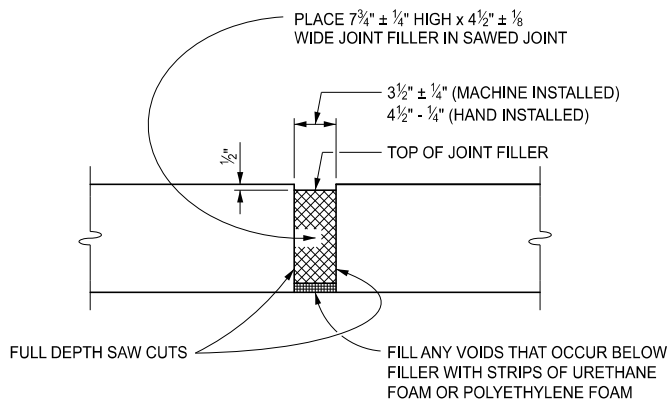
STANDARD PLAN FOR CONCRETE PAVEMENT REPAIR

(SPECIAL DETAIL)
FHWA APPROVAL

09/18/2023
PLAN DATE

R-44-G

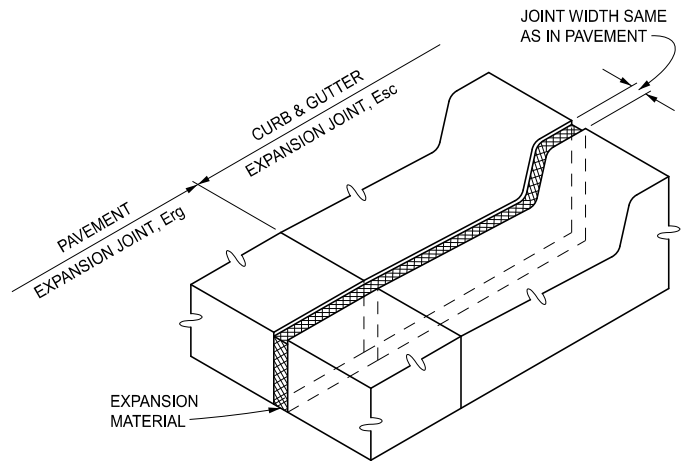
SHEET
6 OF 7



NOTES:
WHEN PRESSURE RELIEF JOINT IS TO BE CONSTRUCTED THROUGH CONCRETE SHOULDER, TRENCHING BELOW CONCRETE MAY BE NECESSARY TO ALLOW ROOM FOR 7 1/4" FILLER.

PRESSURE RELIEF JOINT

THIS DETAIL ALSO APPLIES TO HMA SURFACED CONCRETE PAVEMENT REQUIRING PRESSURE RELIEF JOINTS



CURB, GUTTER, AND CURB FACE SHALL BE SAWED AS DEEP AS THE EXISTING PAVEMENT THICKNESS. THE REMAINING CONCRETE SHALL BE CHIPPED OUT AND EXPANSION MATERIAL OF SUFFICIENT THICKNESS SHALL BE PLACED IN SAWED JOINT TO FILL THE GAP AS DIRECTED BY THE ENGINEER.

EXPANSION JOINT, Esc

NOTES:

CONCRETE PAVEMENT REPAIRS (INCLUDING JOINT TYPES) OR PRESSURE RELIEF DETAILS SHALL BE AS SPECIFIED ON THE PLANS OR IN THE LOG OF PROJECT.

IF THE EXISTING PAVEMENT HAS A HMA SURFACE, THE SAW CUTS SHALL EXTEND THROUGH THE UNDERLYING PORTLAND CEMENT CONCRETE.

SAW OVERCUTS IN ADJACENT LANE, SHOULDER, RAMP, AND GUTTERS THAT WILL REMAIN IN PLACE, SHALL BE CLEANED AND THEN SEALED WITH HOT-POURED RUBBER-ASPHALT.

WHEN THE CONCRETE PAVEMENT REPAIR IS CONSTRUCTED IN PREPARATION FOR AN OVERLAY, Crg JOINT RESERVOIRS AND SEALANTS SHALL BE OMITTED AND EXPANSION JOINTS (Erg) SHALL HAVE THE FIBER JOINT FILLER KEPT FLUSH TO THE PAVEMENT SURFACE.

EXPANSION CAPS SHALL BE ACCORDING TO STANDARD PLAN R-40-SERIES.

TRANSVERSE CONTRACTION Cp AND EXPANSION E2 JOINTS SHALL BE ACCORDING TO STANDARD PLAN R-39-SERIES.

DOWEL AND DEFORMED BARS USED IN Trg, Crg, AND Erg JOINTS SHALL BE EPOXY COATED ACCORDING TO THE CURRENT STANDARD SPECIFICATIONS.

DOWEL BARS AND DEFORMED BARS FOR TIED JOINTS SHALL BE GROUTED INTO EXISTING PAVEMENT WITH A GROUT SELECTED FROM THE PREQUALIFIED MATERIALS LISTED IN THE DEPARTMENT'S "MATERIALS SOURCE GUIDE" UNDER ADHESIVE SYSTEMS FOR GROUTING DOWEL BARS AND TIE BARS FOR FULL-DEPTH CONCRETE PAVEMENT REPAIRS.

THE BACKER ROD SHALL MEET THE REQUIREMENTS OF THE STANDARD SPECIFICATIONS FOR CONSTRUCTION.

THE SAME TYPE JOINT SHALL EXTEND ACROSS ADJACENT LANE REPAIRS.

AFTER GROUTING IN-PLACE, RC-250 OR AN APPROVED BOND BREAKER SHALL BE APPLIED TO THAT PORTION OF Crg AND Erg DOWEL BARS THAT EXTEND INTO THE CAST CONCRETE.

REPAIRED CONCRETE PAVEMENTS REQUIRE THAT 1" OF Erg EXPANSION JOINTS BE DISTRIBUTED THROUGHOUT A GIVEN 1000' SECTION.

WHERE THERE ARE NO REPAIR LOCATIONS WITHIN A 1000' LENGTH, NO EXPANSION SPACE WILL BE PROVIDED.

EXPANSION JOINT FILLER SHALL EXTEND THE FULL DEPTH OF THE REPAIR AND BE FLUSH WITH THE EXISTING PAVEMENT SURFACE. PRIOR TO SEALING, THE JOINT FIBER FILLER AT THE PAVEMENT SURFACE SHALL BE REMOVED BY CUTTING 1" WIDE AND 1 1/2" DEEP TO PERMIT THE PLACEMENT OF THE HOT-POURED RUBBER ASPHALT SEALANT. HOLES IN EXPANSION JOINT FILLER SHALL BE 1 1/2" MAXIMUM DIAMETER AND SHALL BE ALIGNED TO FIT DRILLED HOLES IN CONCRETE.

Erg JOINTS SHALL BE CONSTRUCTED ONLY WHEN THEY EXTEND ACROSS ALL LANES, RAMP, OR SHOULDERS.

WHEN Erg JOINTS ARE PLACED ADJACENT TO CONCRETE CURB AND GUTTER THAT IS NOT REQUIRED TO BE REMOVED, AN Esc JOINT SHALL BE CONSTRUCTED IN THE CURB AND GUTTER.

JOINT RESERVOIRS FOR THE HOT-POURED RUBBER-ASPHALT SEALANT SHALL BE ABRASIVE BLAST CLEANED, FOLLOWED BY A FINAL CLEANING OF OIL-FREE COMPRESSED AIR PRIOR TO SEALING.

LANE TIES (TO ADJACENT PAVEMENT LANE, WHEN REQUIRED) SHALL BE SPACED ACCORDING TO STANDARD PLAN R-41-SERIES, EXCEPT THAT THE FIRST LANE TIE ADJACENT TO A TRANSVERSE JOINT SHALL BE INSTALLED AT A DISTANCE OF 1'-8" FROM THE JOINT. WHEN BOTH SIDES OF A LONGITUDINAL JOINT ARE POURED INTEGRALLY, LANE TIES SHALL BE STRAIGHT DEFORMED EPOXY COATED BARS CAST-IN-PLACE AS SPECIFIED ON STANDARD PLAN R-41-SERIES. WHEN ADJACENT LANES ARE CAST SEPARATELY, LANE TIES SHALL BE GROUTED-IN-PLACE AS SPECIFIED ON THIS PLAN. THE GROUT SHALL BE SELECTED FROM THE PREQUALIFIED MATERIALS LISTED IN THE DEPARTMENT'S "MATERIALS SOURCE GUIDE", UNDER LANE TIES.

THE MONTH AND YEAR OF CASTING AND STATION NUMBER (IF REMOVED) SHALL BE STENCILED ON EACH CONCRETE REPAIR.

ALL REPAIRS WILL BE JOINTED PLAIN CONCRETE PAVEMENT.



DEPARTMENT DIRECTOR
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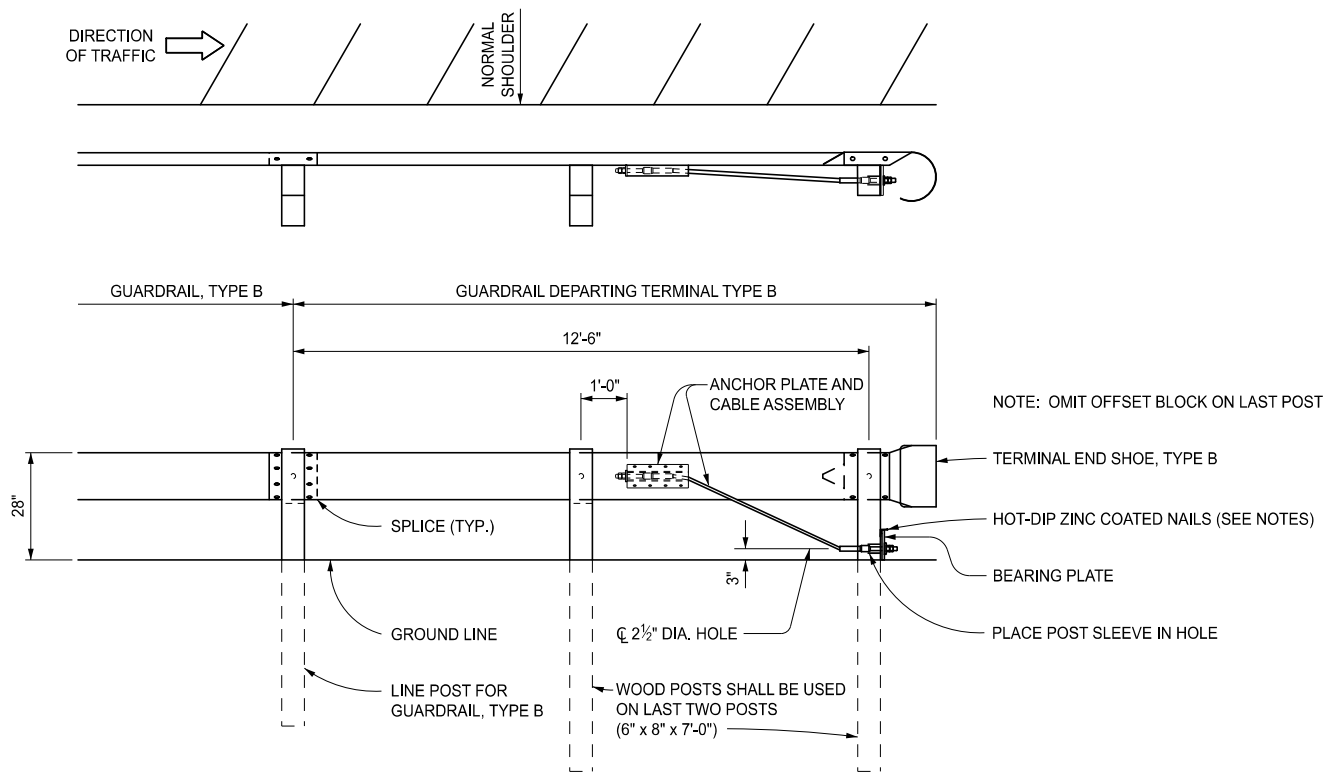
STANDARD PLAN FOR CONCRETE PAVEMENT REPAIR

(SPECIAL DETAIL)
FHWA APPROVAL

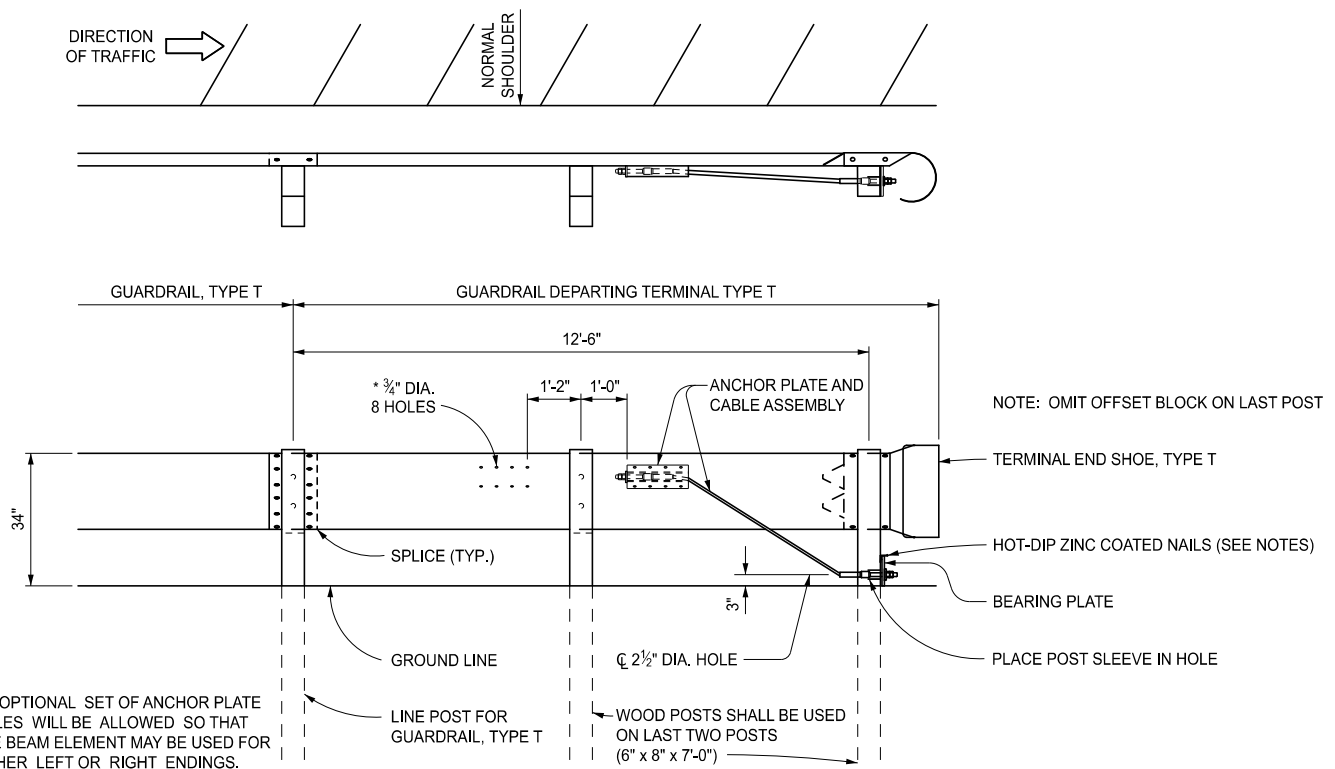
09/18/2023
PLAN DATE

R-44-G

SHEET
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GUARDRAIL DEPARTING TERMINAL TYPE B



GUARDRAIL DEPARTING TERMINAL TYPE T

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT



DEPARTMENT DIRECTOR
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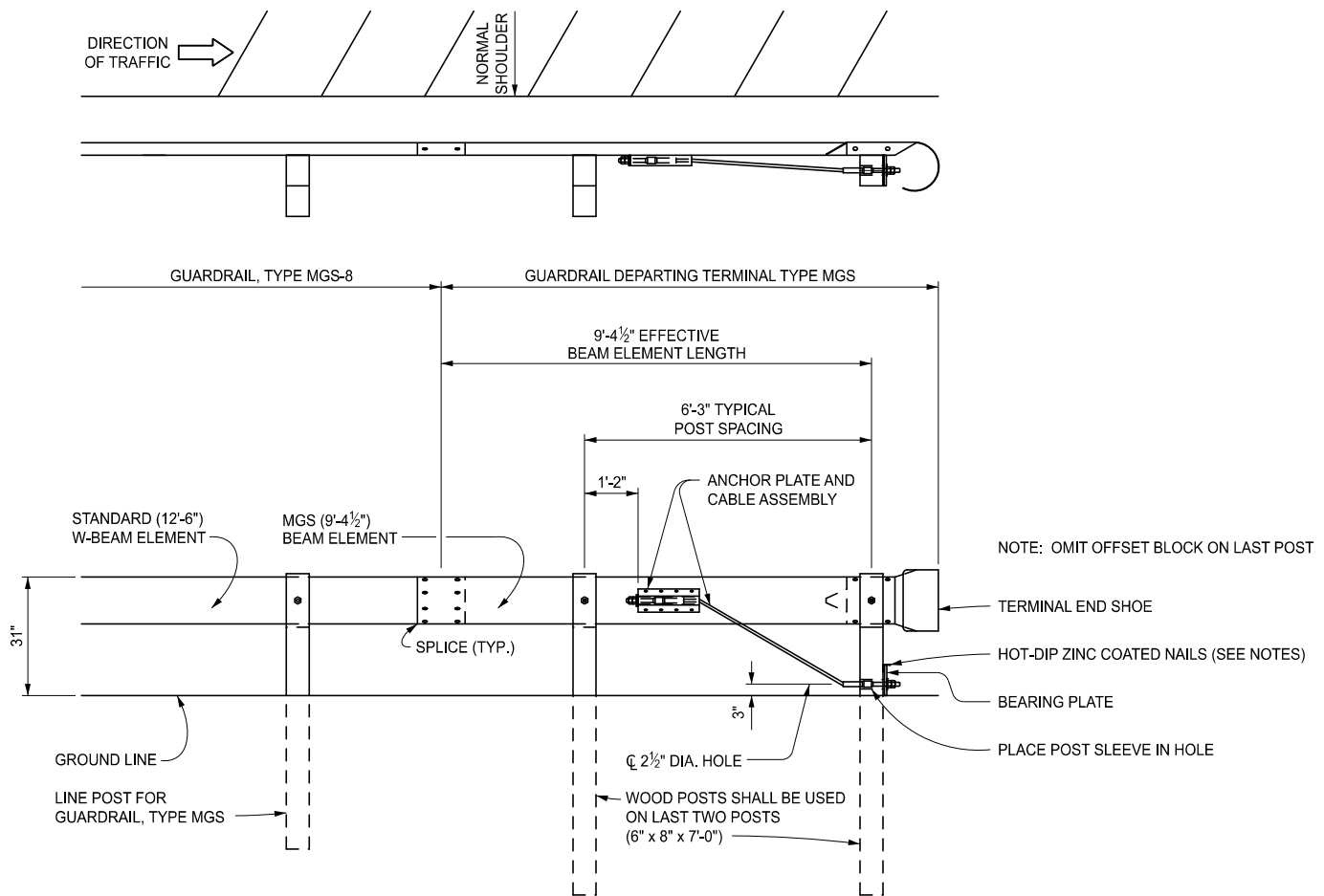
STANDARD PLAN FOR
GUARDRAIL DEPARTING TERMINAL TYPES B, T, & MGS

(SPECIAL DETAIL)
FHWA APPROVAL

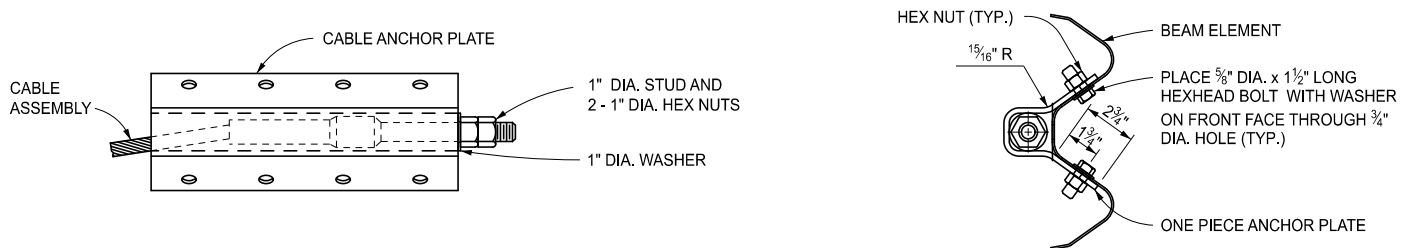
09/14/2023
PLAN DATE

R-66-E

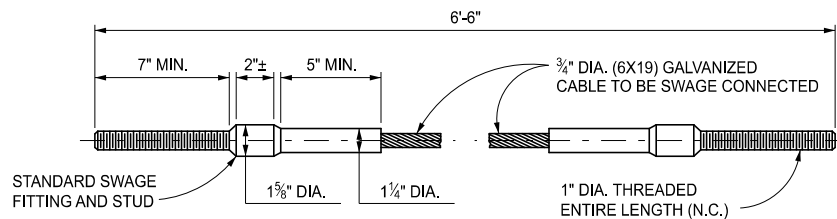
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GUARDRAIL DEPARTING TERMINAL TYPE MGS



CABLE ANCHOR PLATE DETAILS



CABLE ASSEMBLY



DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

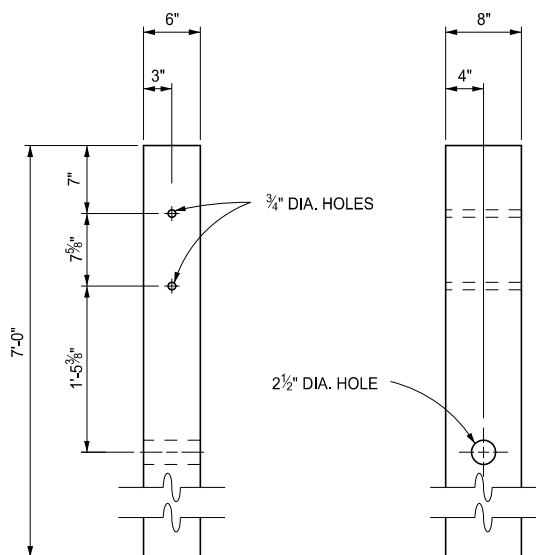
STANDARD PLAN FOR
GUARDRAIL DEPARTING TERMINAL TYPES B, T, & MGS

(SPECIAL DETAIL)
FHWA APPROVAL

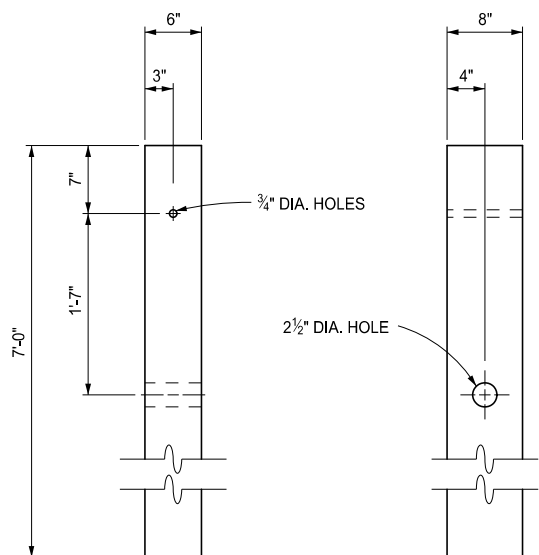
09/14/2023
PLAN DATE

R-66-E

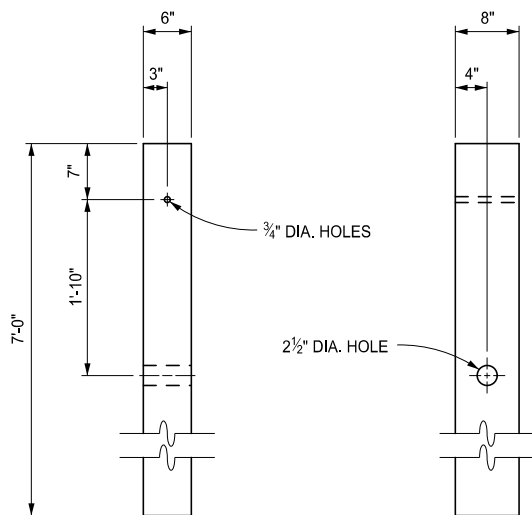
SHEET
2 OF 4



WOOD POST DETAIL
(FOR LAST POST, GUARDRAIL DEPARTING TERMINAL TYPE T)



WOOD POST DETAIL
(FOR LAST POST, GUARDRAIL DEPARTING TERMINAL TYPE B)



WOOD POST DETAIL
(FOR LAST POST, GUARDRAIL DEPARTING TERMINAL TYPE MGS)



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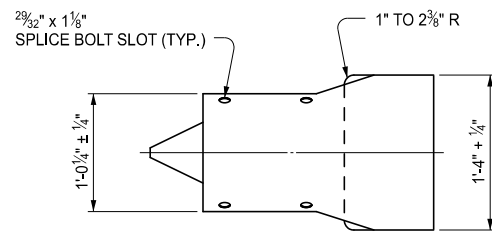
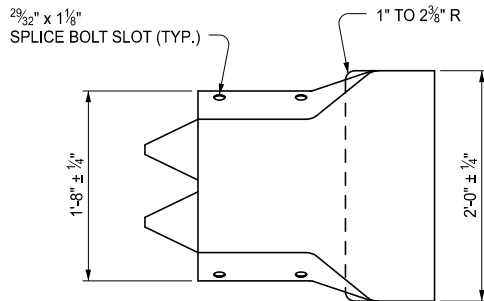
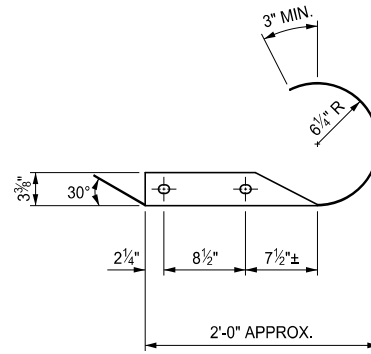
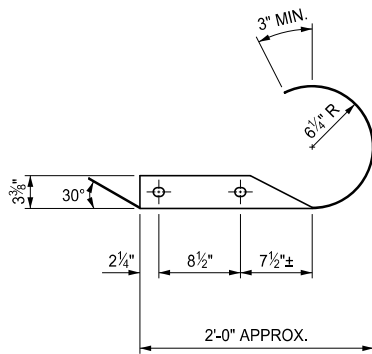
STANDARD PLAN FOR
GUARDRAIL DEPARTING TERMINAL TYPES B, T, & MGS

(SPECIAL DETAIL)
FHWA APPROVAL

09/14/2023
PLAN DATE

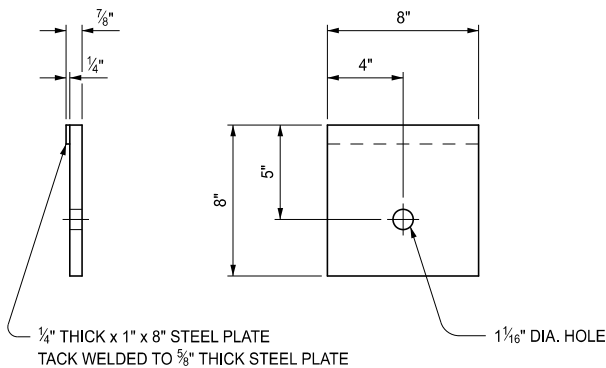
R-66-E

SHEET
3 OF 4



TERMINAL END SHOE,
TYPE A, TYPE B OR TYPE MGS

TERMINAL END SHOE, TYPE T



BEARING PLATE



POST SLEEVE

NOTES:

ALL POSTS, OFFSET BLOCKS, BEAM ELEMENTS, AND HARDWARE (INCLUDING BOLTS, NUTS, AND WASHERS) SHALL CONFORM TO THE STANDARD SPECIFICATIONS FOR CONSTRUCTION AND TO STANDARD PLAN R-60-SERIES, WHERE APPLICABLE, EXCEPT AS SPECIFIED ON THIS STANDARD.

ALL 1:10 SLOPES SHALL BE GRADED TO CLASS A SLOPE TOLERANCES.

FOR DETAILS OF GUARDRAIL PLACEMENT, SEE STANDARD PLAN R-59-SERIES.

AFTER THE CABLE ASSEMBLY HAS BEEN TIGHTENED, A SECOND NUT SHALL BE INSTALLED ON EACH END OF THE CABLE SO THAT THE CABLE WILL NOT LOOSEN.

TWO HOT-DIP ZINC COATED NAILS SHALL BE DRIVEN INTO THE WOOD POST AT THE TOP OF THE BEARING PLATE TO KEEP THE BEARING PLATE FROM ROTATING.



DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

STANDARD PLAN FOR
GUARDRAIL DEPARTING TERMINAL TYPES B, T, & MGS

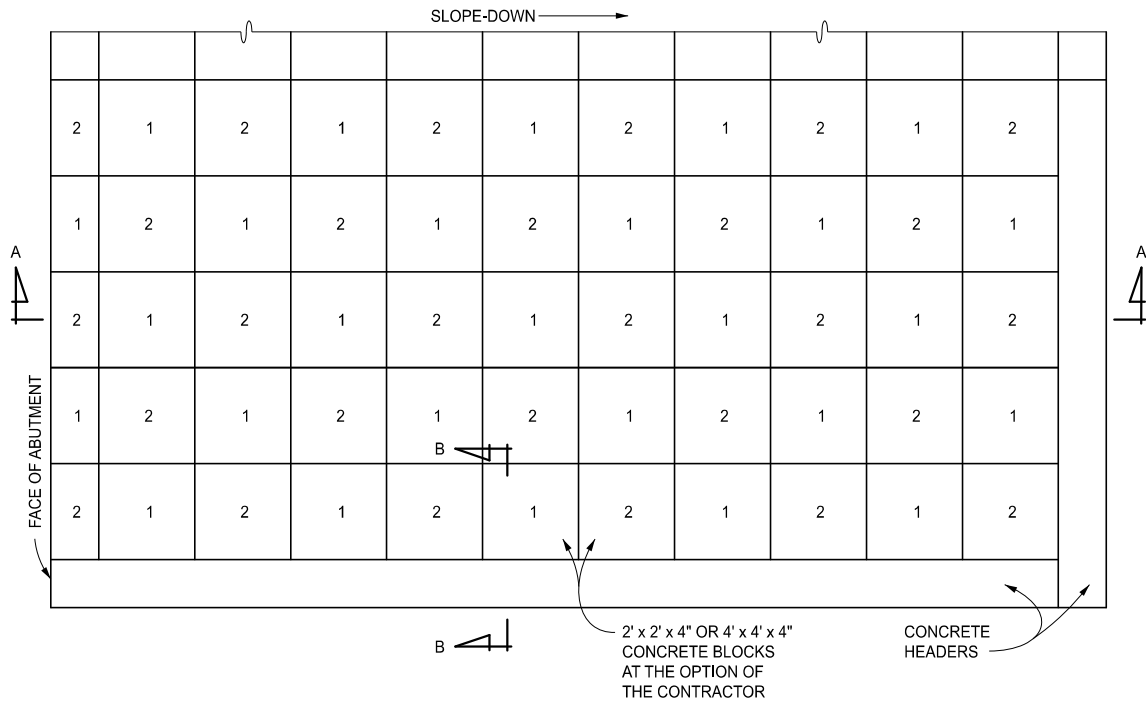
(SPECIAL DETAIL)
FHWA APPROVAL

09/14/2023
PLAN DATE

R-66-E

SHEET
4 OF 4

SLOPE PAVING, CONC



PLAN

APPROVED BY: _____
DIRECTOR, BUREAU OF BRIDGES AND STRUCTURES

APPROVED BY: _____
DIRECTOR, BUREAU OF FIELD SERVICES

APPROVED BY: _____
DIRECTOR, BUREAU OF DEVELOPMENT



DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

STANDARD PLAN FOR STANDARD SLOPE PAVING DETAILS

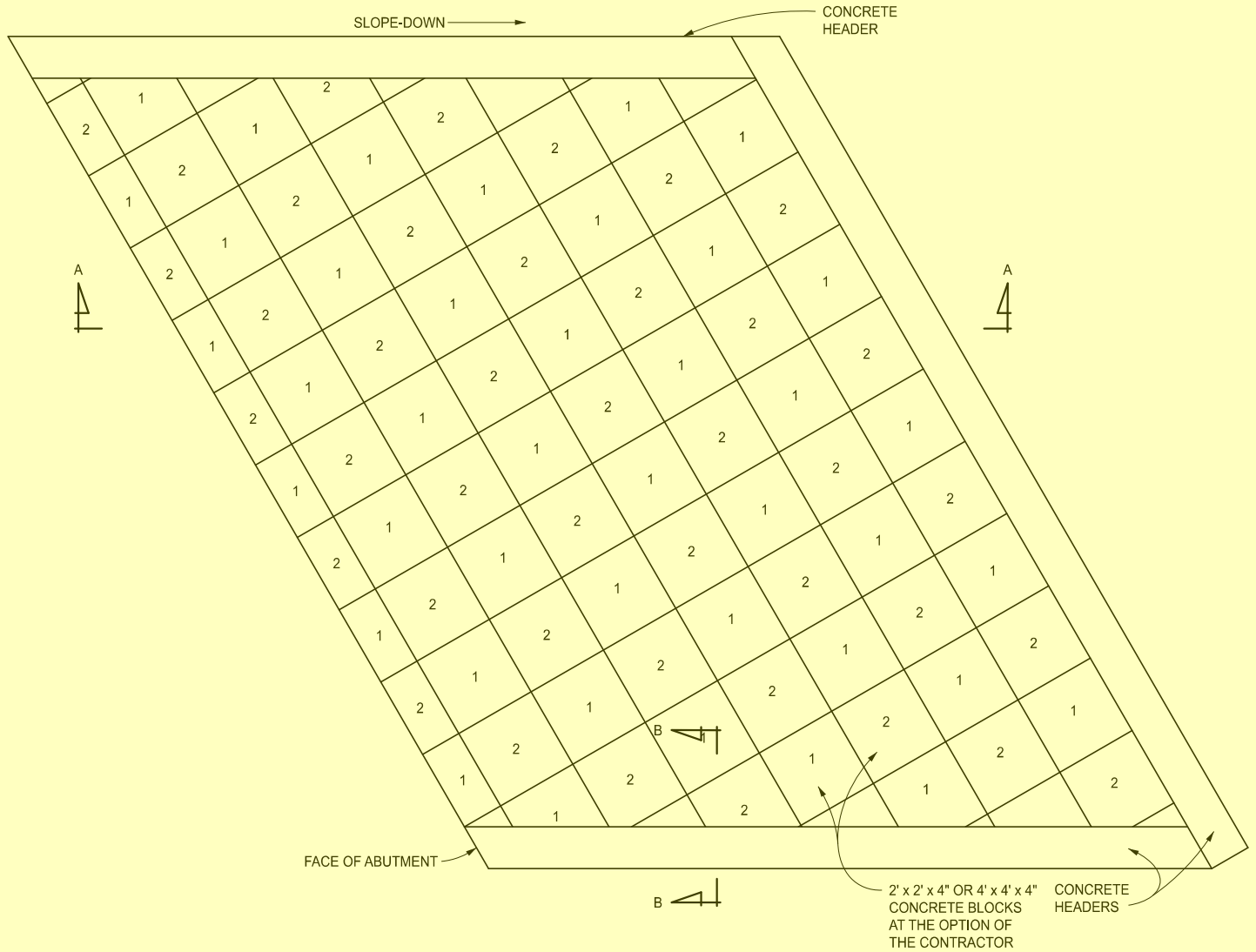
(SPECIAL DETAIL)
FHWA APPROVAL

09/18/2023
PLAN DATE

B-102-D

SHEET
1 OF 4

SLOPE PAVING, CONC



PLAN AT SKEW
(APPROXIMATELY 15 DEGREES OR MORE)



DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

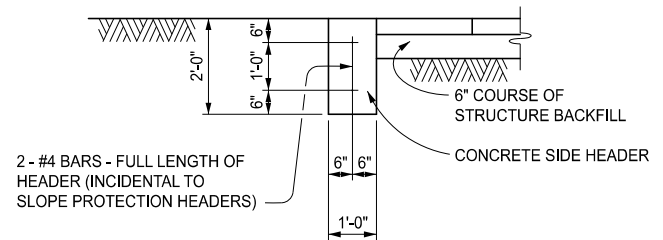
STANDARD PLAN FOR STANDARD SLOPE PAVING DETAILS

(SPECIAL DETAIL)
FHWA APPROVAL

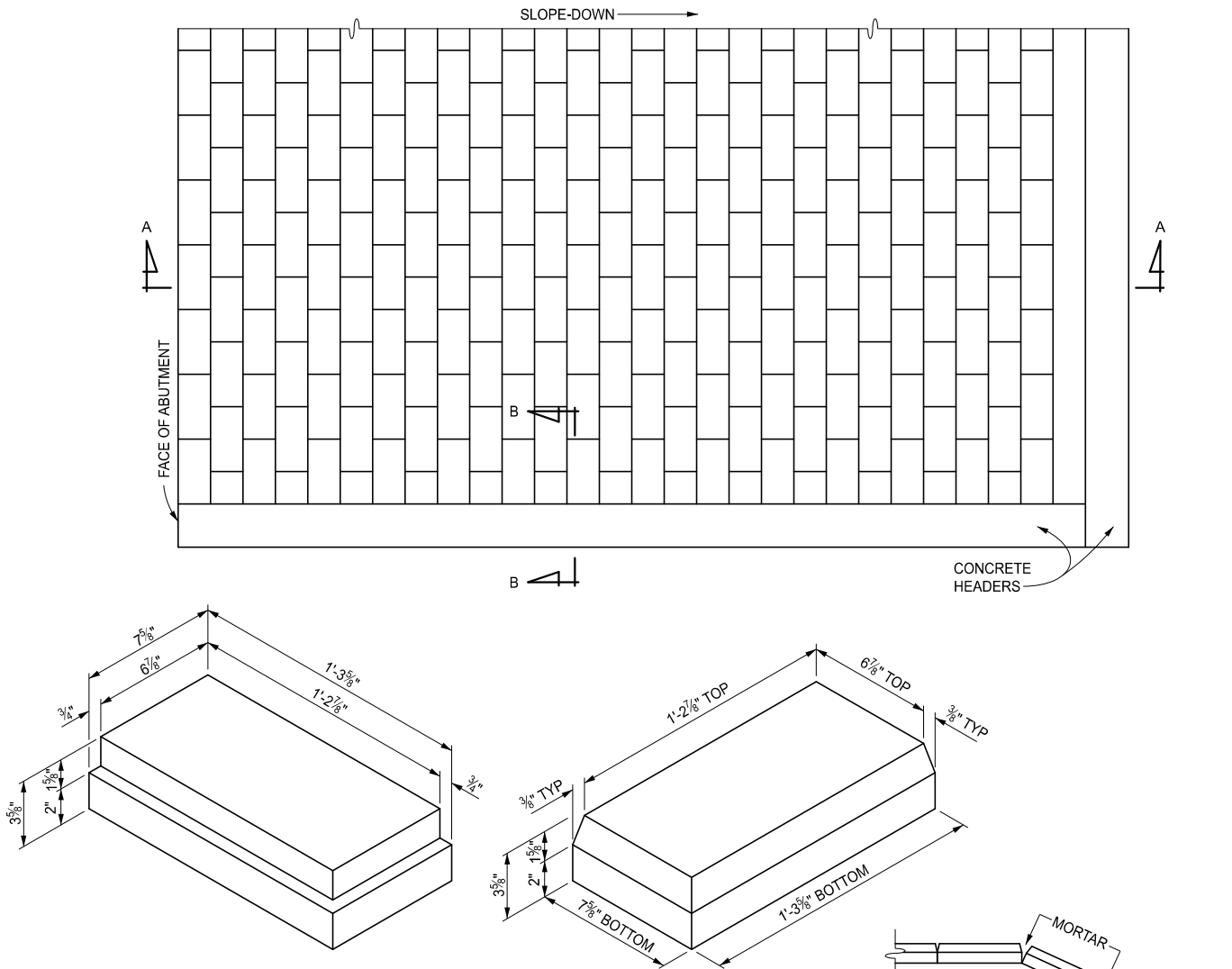
09/18/2023
PLAN DATE

B-102-D

SHEET
2 OF 4

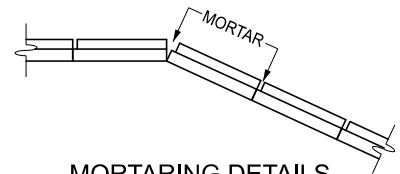
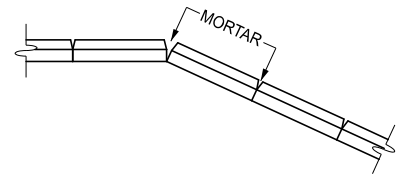


SLOPE PAVING, PRECAST CONC



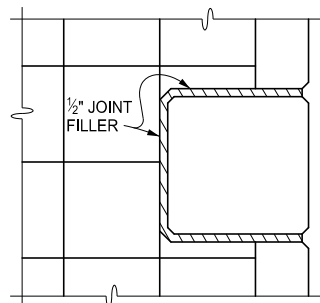
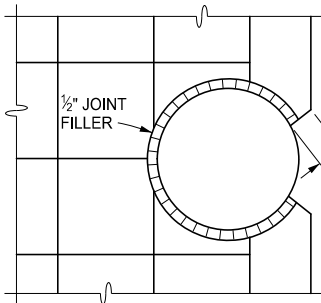
BASIC BLOCKS

(RECTANGULAR OR V-JOINT AT OPTION OF MANUFACTURER)



MORTARING DETAILS

(MORTAR JOINTS AFTER BLOCKS ARE IN PLACE)



AT ROUND COLUMNS

AT SQUARE COLUMNS

DETAILS OF SLOPE PAVING AT PIER COLUMNS

NOTES:

$\frac{1}{2}"$ JOINT FILLER SHALL BE PLACED BETWEEN THE PIER COLUMNS OR PIER WALLS AND THE SLOPE PAVING. THE JOINT FILLER SHALL ALSO BE PLACED BETWEEN THE HEADER AND PIER COLUMNS. THE JOINT FILLER SHALL BE THE FULL DEPTH OF SLOPE PAVEMENT OR HEADER.

A VARIATION OF $\frac{1}{8}"$ PLUS OR MINUS IN THE DIMENSIONS FOR PRECAST CONCRETE BLOCKS WILL BE ALLOWED.

VARIATIONS IN JOINT DETAILS FOR SLOPE PAVING, PRECAST CONCRETE WILL BE ACCEPTABLE SUBJECT TO APPROVAL OF THE ENGINEER.



DEPARTMENT DIRECTOR
BRADLEY C. WIEFERICH, PE

STANDARD PLAN FOR STANDARD SLOPE PAVING DETAILS

(SPECIAL DETAIL)
FHWA APPROVAL

09/18/2023
PLAN DATE

B-102-D

SHEET
4 OF 4

MICHIGAN DESIGN MANUAL ROAD DESIGN

6.03.09 (revised 9-25-2023)

Hot Mix Asphalt (HMA) Mixture Selection Guidelines

This guide is to aid in the selection of Hot Mix Asphalt (HMA) mixtures, asphalt binders and Aggregate Wear Index values. It is the ultimate responsibility of the Region Soils/Materials Engineer to provide appropriate hot mix asphalt and thickness recommendations. Any questions regarding these guidelines should be addressed to either the HMA Unit or the Pavement Design Engineer in the Construction Field Services Division.

A. Rehabilitation, Reconstruction (R&R) and New Construction Projects

1. Mainline Paving

a) Mixture Selection

All mainline paving shall be composed of Superpave mixtures.

Computed Design BESALs (HMA Equivalent Single Axle Load) will be used to identify the appropriate Superpave mixture type.

6.03.09A1a (continued)

Superpave Mix Type	Design BESAL (millions)
EL	Less than 0.3
EML	Between 0.3 and 3.0
EMH	Between 3.0 and 30.0
EH	Between 30.0 and 100.0
SMA	Between 10.0 and 100.0

SMA is to only be used as a top course mixture.

Design BESALs are calculated using the following information:

- Commercial Traffic
- Traffic Growth Rate
- Lane Distribution of Commercial Traffic
- BESAL Axle Load Equivalency for Flexible Pavement
- Total accumulated BESALs for 20 year design

The method for calculating ESALs for flexible pavements (BESALs) is explained in the **AASHTO Guide for Design of Pavement Structures**, 1993. Design BESALs should be requested from the Project Planning Section of the Project Planning Division. The Pavement Design Engineer of the Pavement Management Section of the Construction Field Services Division can provide an approximate BESAL value (for estimating purposes only). Show the 20 year design BESALs on the design plans.

b) Superpave Mixture Number Designation and Thickness Guidelines

After mixture selection has been determined, based on design BESALs, the mixture number for use in the various pavement courses can be determined. The mixture number will be 2, 3, 4 or 5 depending on the nominal maximum size aggregate. Following are the mixture numbers, minimum/maximum application rates and course type application:

MICHIGAN DESIGN MANUAL ROAD DESIGN

6.03.09A1b (continued)

Hot Mix Asphalt (HMA) Mixture Selection Guidelines

Mixture #	Minimum Application	Maximum Application	Course Application
2	435 lbs/syd	550 lbs/syd	Base
3	330 lbs/syd	410 lbs/syd	Base and/or Leveling
4	220 lbs/syd	275 lbs/syd	Leveling and/or Top
5	165 lbs/syd	220 lbs/syd	Top
SMA (3/8" Nom. Max.)	165 lbs/syd	225 lbs/syd	Top
SMA (1/2" Nom. Max.)	220 lbs/syd	275 lbs/syd	Top
ASCRL	255 lbs/syd	425 lbs/syd	Base

NOTES:

1. Estimated application rate of 110 lbs/syd. per inch of compacted thickness. When using GGSP contact the HMA Unit at the Construction Field Services Division for the estimated application rate. When using ASCRL the estimated application rate is 100 lbs/syd per inch of compacted thickness.
2. Pavement designs requiring greater thickness than the specified maximum will require multiple lifts.
3. Crush and Shape: Use a minimum of two lifts over crushed materials. A minimum of 220 lbs/syd for the first lift is required for construction purposes.
4. Rubblized Concrete: The first lift over the rubblized concrete will be a minimum of 220 lbs/syd. For freeways and divided highways, traffic should not be allowed on the rubblized section until at least two courses have been placed. In those situations where the rubblized roadway must be opened to traffic at the end of each day, traffic may be allowed on the first course provided there is a minimum thickness of 265 lbs/syd.

The following are the Superpave definitions for Top, Leveling and Base course. This definition should be referred to when making the asphalt binder and mixture selections: **The Top and Leveling courses are defined as the mixture layers within 4 inches of the surface; the base course is defined as all layers below 4 inches of the surface. For mixture layers which fall within the 4 inch threshold, the following rule should apply: If less than 25% of a mixture layer is within 4 inches of the surface, the mixture layer should be considered to be a base course.**

MICHIGAN DESIGN MANUAL BRIDGE DESIGN - CHAPTER 7: LRFD

7.01.15

Shoulder Widths for Work Zone Safety and Mobility (8-20-2009) (6-16-2014)

For 2 lane freeway and interstate new bridge construction and superstructure replacements the standard bridge shoulder widths shall be 14'-10". This will provide increased safety and mobility for future maintenance of traffic. The cross section will provide part width bridge construction with traffic being maintained on two 11 ft. lanes with 1 ft. shy distance on each side. For cross section see Bridge Design Guide 6.05.01A. A design exception will be required when the shoulder width is not met. The Region shall determine the required shoulder width at the scoping of the projects. (9-25-2023)

For shoulder widths for deck replacements, see section 7.02.31. A design exception will be required when the shoulder widths provided on deck replacement projects do not meet those required in section 7.02.31. Shoulders wider than those specified in section 7.02.31 may be required to accommodate corridor mobility needs and to accommodate the future maintenance of traffic needs for projects affecting infrastructure adjacent to the bridge. The Region shall determine the required maintenance of traffic needs for the corridor at the scoping of the projects and will document how the corridor mobility needs have been considered in the Scoping Report for the structure. The corridor mobility needs and the proposed clear roadway width for the deck replacement project will be confirmed during the Scope Verification Meeting for the project and the discussion must be documented in the minutes for the meeting. (9-25-2023)

Designers should layout beam spacing to accommodate future part width reconstruction. In most cases beams at centerline of structure should be avoided. (11-28-2011) (12-17-2018)

Bridge approach guardrail and bridge approach curb and gutter will be affected as a result of the widened shoulders and must be addressed in the design of the approaches. If the increased shoulder width is deemed necessary on reconstruction projects substructure widening may become necessary.

7.01.16

Redundancy (8-20-2009) (9-17-2012) (3-23-2020)

Any proposed elements, or systems that do not meet AASHTO and FHWA redundancy requirements are prohibited. Bridge superstructures (beam/slab type) must have a minimum of 3 longitudinal beams or girders.

7.01.17

Part Width Construction (11-28-2011)

For existing bridges used to maintain traffic, the structural performance of the in-service portion of the structure shall be evaluated with respect to stage demolition and adjacent construction.

To the extent possible, plans shall show location of existing spread footings with respect to proposed construction.

Unbraced excavations for new substructures shall not extend below the bearing elevation of adjacent spread footing foundations.

Drilled excavations adjacent to in-service spread footing foundations shall be cased to prevent undermining.

For part-width construction of bridges, provide a minimum of 6' between the centerline of temporary sheeting (along the stage line) and the existing substructure sawcut line. This will allow for the width of sheeting and any required walers and/or tiebacks. (2-26-2018)

MICHIGAN DESIGN MANUAL BRIDGE DESIGN - CHAPTER 7: LRFD

7.03.01 (continued)

Abutment Design

B. Types

4. Integral and Semi - Integral Abutments

Integral and semi-integral abutments shall be used where practical to avoid deck joints. (5-1-2000)

Integral Abutment

Abutment walls (stub type) supported by one row of piles that allow movement through pile flexure (see Bridge Design Guide [6.20.04 series](#)). Walls shall be a minimum of 5'-0" and 12'-0" maximum in height. The H-Pile webs shall be oriented parallel to the bridge reference lines and embedded a minimum of 30" into the abutment wall. Upon recommendation from Geotechnical Services Section pile holes shall be prebored. CIP piles may also be used if recommended by the geotechnical engineer. Embed CIP piles a minimum of 30" into the abutment wall. In general, integral abutments do not have return wingwalls that are attached to the abutment. (6-27-2022)

A separate design analysis needs to be performed on the abutment wall for active and passive pressures. Additional vertical dowels may be required at the abutment and backwall interface to resist the active surcharge and the passive resistance that have been introduced into the wall from bridge expansion. Additional vertical reinforcement may be required in the abutment wall and should also be designed. The pile spacing may need to be adjusted to prevent shear stress failure in the pile.

Due to scour considerations, the designer should usually avoid using Integral abutments at stream crossings unless spill through abutment criteria can be satisfied (Bridge Design Guide [5.47.01](#)) or if abutments are placed outside of the scour limits of the stream crossing. (9-25-2023)

7.03.01 (continued)

Semi-Integral Abutment

Conventional abutment walls fixed in position with expansion and contraction movement of the bridge superstructure (see Bridge Design Guide [6.20.04 series](#)). Abutments with a single row of piles should not be used.

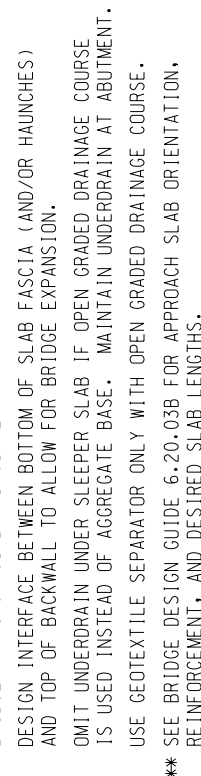
The following design criteria are valid for both types of abutments.

- a. Steel bridges are to be less than 300'-0" and concrete bridges are to be less than 400'-0" in length.
- b. Use approach slab details on Standard Plan R-45-Series when the length of bridge contributing to expansion at an abutment is less than 50'-0" for concrete beam bridges and less than 25'-0" for steel beam bridges. (8-20-2009)
- c. Angle of crossing shall be 60 degrees minimum and 120 degrees maximum. See Section 7.01.14 for MDOT skew policy. (12-5-2005)
- d. Backfill shall be "Backfill, Structure, CIP" as per Standard Specifications.

Place aggregate base or open graded drainage course (OGDC) over structure backfill to support approach slabs, sleeper slabs and approach curb and gutter. (10-22-2012) (12-28-2015)

- e. Pavement seats are 9" wide for dependent backwalls, and approach slabs project to the bridge slab over independent backwalls. Avoid cantilevered pavement seats shall be avoided. (1-24-2022)

ISSUED: 09/25/23
SUPERSEDES: 06/26/23



*** SEE BRIDGE DESIGN GUIDE 6.20.03B FOR APPROACH SLAB ORIENTATION, REINFORCEMENT, AND DESIRED SLAB LENGTHS.

6.20.03A